Zero Retries issue 0017 2021-11-05

Advanced Amateur Radio - Data Communications; Space; Microwave… the fun stuff! Nothing great has ever been accomplished without irrational exuberance - Tom Evslin. Irrational exuberance is pretty much the business model of Zero Retries - Steve Stroh N8GNJ The Universal Purpose of Ham Radio is to have fun messing around with radios - Bob Witte K0NR. We are confronted by insurmountable opportunities! - Pogo

Steve Stroh N8GNJ, Editor

Jack Stroh, Late Night Assistant Editor

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Request to Send

Post-publication update: As of 2021-12-15, my wife Tina KD7WSF and I are no longer associated with the Bellingham Makerspace and the Bellingham Makerspace Amateur Radio Group. Thus ends my experiment to try to create a different kind of Amateur Radio organization at a Makerspace. It might be possible to pivot my ideas for a "new paradigm Amateur Radio Group" to a different community in the Bellingham area - to be determined.

The days are still packed. Fortunately, this week afforded me slightly more time for Zero Retries. Part of what is keeping me busy is various tasks at the Bellingham Makerspace such as building and installing various computers, and running (and fixing) Ethernet instead of every computing device that requires Internet access on the crappy Wi-Fi router that came with the Makerspace's DSL Internet (to be fixed soon). I'm also temporarily in charge of some content being displayed on various displays at the Makerspace, until I can find someone to hand that task off to.

Photo courtesy of Bellingham Makerspace

Amateur Radio at the Bellingham Makerspace scored a nice stealth “mention” in the lead photo of this story - Bellingham’s first Maker Faire showcases work of creators. There’s no mention of Amateur Radio in the article (and the caption in the story is incorrect), but this photo is *all about Amateur Radio*. Pictured L-R are an unknown visitor who is or was an Amateur Radio operator, Mark Allyn WA1SEY, and your humble editor acting as the host of the Amateur Radio area at the Maker Faire.

Another time-consuming task this week has been a “secret mission” for the Makerspace that is now complete that I can’t talk about quite yet, but hopefully soon.

One thing that changed this week is that I began actively Tweeting on Twitter, and tuned up those who I follow, and that has yielded several leads for Zero Retries stories such as the first two stories in this issue. So, welcome those have joined Zero Retries this week after (apparently?) discovering it on Twitter. As I write this, the Zero Retries subscriber count is now 150!

As is my habit in passing through Costco, I browse through the electronics area, especially the televisions, and try to keep my drooling in check. The highest end televisions are… just… *amazing*. With the right image, it feels to me like you’re looking out a window at a nature scene. But what stopped me cold was a Hisense 65” 4k television whose image looked only slightly inferior to the $2000 or so Samsung, Sony, and LG units… but the cost of the Hisense unit was *$509*. After a brief consultation with my wife, we went back the next day (after emptying the rear of our minivan) and bought it as my early Christmas present. I intend to use it as my primary computer monitor on my desk (eventually, wall mounted) to fill up my field of view. I tried this experiment with a similar new 4k television with my laptop a couple of months ago and I found the image to be good enough. The worst that can happen is that I’m not happy with it and I exercise Costco’s generous 30 day return policy for televisions. I’ll probably have it set up in time for Zero Retries 0018 and I’ll let you know how it works out.

New Yaesu FTM-6000R “Data” Radio

New Yaesu FTM-6000R. Photo courtesy of Yaesu.com

The new Yaesu FTM-6000R seems to be a reasonably-priced 144 / 440 MHz radio with flat audio connections ("data") available for faster data communications modes such as 9600 bps packet radio and VARA FM. Its existence seems to have been revealed in early October, 2021 and it is just now available for purchase; at this writing it is $319 at Ham Radio Outlet. I just learned about it early this week… on Twitter. Prior to the mention on Twitter, I had not seen any mention of it, though it's apparently been discussed on several "unboxing" videos on YouTube for several weeks.

I call the FTM-6000R a "data radio" but it's clear that the primary design goals of this radio are to be less expensive and offer simpler operation. Like it, or not, most setup of memory channels on Amateur Radio units these days isn't done (tediously) from the radio's front panel any more. With that in mind, the front panel's controls can be minimized - just rotate the frequency selector to select any of the pre-programmed frequencies and repeater particulars. One of the major cost reductions from Yaesu's other mobile radios seems to be not including Yaesu's proprietary C4FM hybrid digital voice / data capability, and vastly simplifying the control panel to a minimum of controls and an uncomplicated display.

I suspect that the rapid adoption of VARA FM for Winlink Radio Mail Servers (RMS) and Winlink client systems was at least one motivation for the creation of this radio. On radios with with "flat audio" such as the FTM-6000R, VARA FM's "Wide" mode can do up to 25 kbps. At 25 kbps, Winlink is quite usable for sending email messages with file attachments (within reason… we're still talking 25 kilobits, not Megabits).

Another motivation for creating the FTM-6000R may be (what I perceive as) the overall failure of significant adoption of Yaesu's proprietary, and flawed, C4FM hybrid digital voice / data technology and the resulting high priced mobile radios that few Amateur Radio operators are actually buying. A third factor may be the opening in the Amateur Radio market for a data radio resulting from Kenwood's decision to discontinue (or simply no longer being able to manufacture) the popular TM-V71A. (The TM-V71A is still my favorite radio for data communications in Amateur Radio VHF / UHF). The lack of availability, and that few TM-V71As remain in the supply chain, has pushed the price of the remaining new TM-V71As to nearly $500.

Things to like about the FTM-6000R for data use:

- It does provide "flat audio" input and output via a standard 6-pin MiniDIN "data" connector.
- The US version covers 144 - 148 MHz and 440-450 MHz.
- Transmit power levels are 5 watts, 25 watts, and 50 watts.
- The simplified front panel isn't much of an issue for a radio that typically stays parked on a channel for data communications.
- There seems to have been some actual engineering with the fan pulling air around the large heatsink instead of being simple tacked onto the rear of the radio. Perhaps this design's fan will be quiet(er) than the irritating (to me) fan on the TM-V71A.
- It does not suffer the burden of the complexity, and the resulting excessive price, of Yaesu's C4FM technology that would never be used in a data radio.
- The price (at this writing) seems to be a reasonable $320.

Things not to like about the FTM-6000R for data use:

- To use the "flat audio" 6-pin MiniDIN connector requires the purchase of the CT-164 adapter cable (10-pin MiniDIN to 6-pin MiniDIN)- $30. If one can find a 10-pin MiniDIN connector, the $30 cost to buy a short adapter cable might justify fabricating your own version of the CT-164 cable. Yaesu explains the wiring on Page 21 of the FTM-6000R Advance Manual. (Apparently, "Advance" refers to "more detailed, technical" information rather than "early release information".)
- Unlike the TM-V71A, there does not appear to be any ability to control the operating parameters (such as frequency) remotely.
- While the FTM-6000R does have a fan, but the jury is still out about how noisy it is in normal use. We can hope…
- The front panel and radio each have a USB connector, but apparently it is usable only for firmware updates. Each USB connector is confusingly labeled in the manual as "DATA Jack", but at least the manual mentions that they're reserved for firmware updates.

"Don't Cares" about the FTM-6000R for data use:

- Simplification of the user interface. A radio used primarily for data usually stays parked on one frequency.

- One of the cost reductions seems to be that despite being dual band, only the VHF section or the UHF section can be in use at one time. Unlike the TM-V71A, the FTM-6000R cannot operate on VHF and UHF simultaneously. As with the simplification of the front panel, this probably isn't an issue for a radio that stays parked on one channel for data use.
- The optional Bluetooth is usable only for voice.
- Detachable front panel.
- Can receive many different bands.
- Microphone of many buttons.
- Yaesu lists the CT-163 cable, which has both 6-pin MiniDIN and a DSUB-9 connector as compatible with the FTM-6000R. This gives some hint that there is a function for the DSUB-9 connector (conventionally used for RS-232 data). In my reading of the Operating and Advance manuals, I find no mention of what function this DSUB-9 connector would serve.

  After a more careful reading (especially the wiring diagrams of the three cables on Page 21 and 22 of the FTM-6000R Advance Manual), I conclude that Pins 7-10 of the 10-Pin MiniDIN connector on the FTM-6000R are used in the CT-166 Cloning Cable for exchanging data between the two radios.

  Thus I conclude that the CT-163 cable can, eventually, be used for programming the FTM-6000R externally using some as-yet unreleased programming utility or technical information that would make it possible for Chirp and similar software to program the memory channels en masse. Chirp may well work already with the FTM-6000D - the *FTM-350, FTM-3100 (use FTM-3200D selection), and FTM-3200D* are already listed in Chirp's *Supported Radio Models*.

  Again, in my opinion, the presence of, or lack of, external programming capability isn't a major consideration for a data radio that tends to stay on one channel most of the time.

In the end, for my purposes, the three critical qualifications of the FTM-6000R as a usable data radio are:

- It has the easy-to-interface 6-pin MiniDIN connector with flat audio available,
- It is priced reasonably for a new radio - $320,
- It is a new design and currently being manufactured, and thus likely more widely available than the TM-V71A which is no longer being manufactured.

Kudos, Yaesu. The FTM-6000R seems like a worthy data radio. I look forward to having two in N8GNJ Labs to warm them up with some bit transport.

ARDC Grant Award for the ARISS-USA STEREO Education Project

I think this is a *big* deal! I mention it here because this really resonates with the Zero Retries Mission to discuss the cool stuff that's happening in Amateur Radio.

> ARISS-USA is pleased to announce that Amateur Radio Digital Communications (ARDC) awarded a 5-year grant for a project called, "Student and Teacher Education via Radio Experimentation and Operations" (STEREO). Total grant funding over five years is nearly $1.3 million. This ARDC grant will fund three distinct initiatives that enable ARISS to sustain and improve STEAM educational outcomes:
>
> Part 1: ARISS is developing a wireless electronics technology kit called "SPARKI", short for "Space-Pioneers Amateur Radio Kit Initiative" for use with middle and high school students. This ARDC grant will take SPARKI from prototype to operational and then deploy these kits into a selected set of ARISS formal and informal education organizations that are planning their ARISS radio contacts.
>
> Part 2: To be successful, ARISS must "Educate the Educator" by creating awareness of ARISS, amateur radio and SPARKI to prospective formal and informal educators in the USA. ARISS-USA will conduct educator workshops for a selected set of educators to aid them in seamlessly employing SPARKI in their education environment and for ARISS to receive their feedback and ideas.
>
> Part 3: The grant will support some of the costs of ARISS contact operations between students and astronauts aboard the ISS over the five-year grant period.

Disclaimer - I was on the ARDC Grants Advisory Committee when this grant was received and discussed. The ultimate decision to award a grant, or not, is done by the ARDC Board. The opinions that follow are my own.

As I said on Twitter when this was made public: *All of the grants that ARDC provides are special, but some are a bit extra special*. I think ARISS has this initiative exactly right. To get ARISS, and education about space technology, and especially human exploration of space, into *many* more classrooms, educators need a well-developed hands-on activities, devices, etc. as part of a space curriculum. ARISS is now funded to do so. I can't wait to see how SPARKI turns out! Kudos, ARISS, and I'm proud of ARDC for funding this.

Amateur Radio Won't be on the ARTEMIS II Mission

Frank Bauer KA3HDO, ARISS-USA Executive Director and ARISS International Chair recently reported:

> In January this year the Amateur Radio Exploration (AREx) team of ARISS and AMSAT submitted a no-cost proposal to fly hardware and cameras on NASA's Artemis II mission to the moon to bring "The Excitement and Inspiration of Artemis Journeys to a Worldwide Audience through Interactive Amateur Radio Experiences." Artemis 2 is the first planned human spaceflight mission to the moon. Like the Apollo 8 mission, it plans to orbit the moon and return to Earth. Recently we got word that we were not competitively selected for the mission.
>
> I just found out who won the competition. The winners, National Geographic and Disney, were, in my opinion, unbeatable challengers for

> documenting and sharing truly historic events --- especially the return of humans to the moon.

I really appreciate, and agree with Jeff Davis KE9V's take on this development:

> Humans are moving into space and in the same way the polar explorers brought amateur radio along with them in the 20th century, 21st century space explorers will do the same.
>
> **In many ways the future of ham radio is in space.**
>
> In another decade hams won't chase satellites in low-earth orbit, but will instead point their antennas at outposts on the moon and eventually, Mars. Our need for accelerated innovation in the area of deep space communication networks to support these planned missions will be the fuel that sustains and grows our hobby deep into its Second Century and beyond.

Jeff's perspective is exactly why I advocated vigorously within the ARDC Grants Advisory Committee to fund needed repairs to the "Big Dish" used by W1MX, the MIT Radio Society, so Amateur Radio would have such facilities to be able to conduct deep space communications. (Speaking of the the "Big Dish", some photos of the renovation work were recently posted.)

For a 1 kbps Link on a 15 km Path, (Mostly) All You Need is Software

If you're good enough… I confess that I haven't anticipated reading installments about "them that's doing cool things in Amateur Radio" like David Rowe VK5DGR since the days of Bdale Garbee KB0G (then N3EUA) extolling his latest exploits in his Bits In The Basement column in the TAPR Packet Status Register newsletter.

Photo courtesy of David Rowe VK5DGR

Yep. That's a photo of a bleeding edge experimental radio transceiver for data. Pretty much *all* of it.

I'm eagerly following VK5DGR's Open IP over VHF/UHF project. He recently posted Installment 5 of his quest to create what will ultimately be a 100 kbps data communications system consisting mostly of a Raspberry Pi, a software defined receiver dongle, and software. As he says… *lots* of software.

> I've been having fun testing my data radio system over the air for the first time. This involved a few false starts, careful testing, tracking down a few bugs, and tuning the system to handle local EMI and strong pager signals. The good news is – it works! Using 10mW of transmitter power I have established a 1 kbit/s link over a 15km urban path using a RpiTx transmitter and RTL-SDR receiver. Plus lots of software.
>
> …
>
> Next steps:

- Rework the acquisition system so it can handle strong signal immediately followed by a weak signal.
- A semi-permanent installation that runs for a month to gather long term stats and make sure nothing breaks in real world operation.
- A better link that can sustain 100 kbit/s. We need about 20dB more link budget for that. A directional antenna would be useful to try. My current antennas collect EMI power from all directions. A directional antenna would suppress EMI, and reduce the power from local strong signals, allowing me to bump up the RTL-SDR gain and enjoy a lower noise figure. A directional antenna would also increase the wanted signal receive power, further improving the link margin.

10 milliwatts - 0.010 watts of transmit power for a 1 kbps link over 15 km (in an urban area). This is "Dancing Bear" stuff… the wonder isn't that the bear dances well… it's that the bear dances *at all*. Gobsmacked. Just. Gobsmacked. This stuff is *so* cool.

ZR > BEACON

- Ham Radio is Alive and Well by Gary Drasch K9DJT is a book title that grabbed my attention during a quick browsing of the book section of DX Engineering. Here are the first two paragraphs of the description:

  "Ham Radio is Alive and Well" - The chance of anyone interested in ham radio, who reads this book, and not learning something new, is nil. This book is packed full of information that is not only useful for new radio amateurs, but seasoned hams as well!

  The author, Gary, writes as if he is having a conversation with you over a cup of coffee. Many lesser-understood topics are explained in such a manner that anyone can understand them. He shares what he has learned in recent years, and explains how ham radio has evolved and lived on amidst smartphones, PCs, and the Internet. The hobby of Amateur Radio is not dying, but instead, it is thriving and actually GROWING!

  Given that K9DJT's premise overlaps with my premise here in Zero Retries, I'll be ordering (edit - now ordered) this book. Look for a review "in a while".

- Continuing in the "Days are just PACKED" vein, I'll pass this along from Libre Space Foundation (creators of SatNOGS open-source satellite ground station and network) without any context. A quick look at this info looked interesting, but would require more bandwidth than I have available at the moment.

  The full video playlist of the presentations of the SDR MakerSpace online event!
  On September 06-08 2021, the European Space Agency and Libre Space Foundation (LSF) co-organised a 3-day online seminar. The event featured a series of fascinating talks providing a technical briefing on the outcomes of the ESA ARTES SDR MakerSpace activity implemented by LSF and Hes-So.
  Check out the Playlist

- MIT Radio Exam Team Conducts 250th Fully-Remote Exam. I saw this headline from 2020-10-22 as I was checking the W1MX website for my postscript to *Amateur Radio Won't be on the ARTEMIS II Mission*.

  Since 1985 — just after the inception of the Volunteer Examiner (VE) system the previous year — once a month, volunteers with the MIT Radio Exam Team have offered amateur radio exams to both aspiring new operators and existing hams seeking to upgrade their license class. For most of its history, these sessions took place in classrooms on the MIT campus. But when the COVID-19 pandemic brought the country to a grinding halt in March, the team was forced to suspend its usual in-person exams — this was the first time in its 35 year history that the team had ever missed a planned session, even when they were scheduled on Christmas Eve or during a blizzard. Many other teams followed suit, creating a nationwide backlog of applicants unable to take their tests.

  Not willing to let the pandemic stand in the way of getting new hams on the air, the amateur radio community came together to do what it does best: solve tough problems with ingenuity and technology. Over the course of Spring 2020, hams across the country collaborated to develop a framework for doing something that had never been done before: administering an amateur radio exam fully remotely using video conferencing and a web-based test platform. Given the tight regulations governing these exams by the Federal Communications Commission (FCC), some hams wondered if it was even legal to do so. But thanks to a notice by the FCC clarifying that no rules prohibit the administration of remote ham exams, any lingering doubt was cleared. After all, what better time to get as many people on the air as possible than during a global emergency?

  With a green light from the FCC and further approval from its coordinating VEC, W5YI, the MIT Radio Exam Team seized the opportunity to begin offering remote exams.

  What strikes me about this story is *how is it that this startling success story didn't find its way into mainstream Amateur Radio news?* Maybe I missed it, but the only stories about remote testing I recall reading about were done in Alaska. MIT has done 250 remote exams *as of 2020-10-22*… there must be at least double that by now… from this one (albeit talented) group! Not to mention that they're continuing to offer remote exams as a streamlined process! From now on, this is my go-to for those interested in testing for their Amateur Radio license.

Feedback Loop

- Not much this week, just some scattered admiration for Zero Retries 0016. Thanks for the kind words, folks. Just as well; as I type this, **Near email length limit (!)** has appeared once again, indicating Zero Retries is nearly full to burstin'.

Contributors This Issue

- My thanks to Peter Dahl WA7FUS for a detailed reading of the Yaesu FTM-6000R Advance Manual and pointing out the wiring diagram of the CT-164 cable. I conflated "Advance" with "early" and thus focused on the Operating Manual.

Closing The Channel

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, here are some pointers:

- Dan Romanchik KB6NU offers free PDF versions of his *great* **No-Nonsense Study Guides**.
- HamExam.org Amateur Radio Practice Exams offers good **Flash Card and Practice Exams**.
- When you're ready to take an **Amateur Radio examination** (Tech, General, or Extra), W1MX - The MIT Amateur Radio Society offers remote exams, free for students and youngsters.

Once you do have your Amateur Radio license, you'll be more attractive on dates 😀

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All previous issues of Zero Retries are available without restriction (no paywalls). For some background on Zero Retries, Issue 0000 was The Introduction Issue.

More bits from Steve Stroh N8GNJ:
SuperPacket blog - *Discussing new generations of Amateur Radio Data Communications - beyond Packet Radio (a precursor to Zero Retries)*

N8GNJ blog - *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs - Bellingham, Washington, USA*

Thanks for reading!
Steve Stroh N8GNJ
Bellingham, Washington, USA
2021-11-05
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Below is a much more complete "footer" that has evolved over 30+ issues of ZR.

Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, here are some pointers:

- **Ham Radio for Dummies** by Ward Silver N0AX is a great overview of Amateur Radio. N0AX is a gifted writer and HRFD is now in its 4th edition.
- My two favorite **YouTube** channels for a good overview of Amateur Radio are AmateurLogic.TV. and Ham Nation (part of Ham Radio Crash Course). These folks just seem to have so much fun!
- Radio Amateur Training Planning and Activities Committee (**RATPAC**) offers weekly presentations on general Amateur Radio topics (Wednesdays) and emergency communications in Amateur Radio (Thursdays).
- Dan Romanchik KB6NU offers a free **No-Nonsense Study Guide** for the Technician test (PDF).
- HamExam.org Amateur Radio Practice Exams offers good **Flash Card and Practice Exams**.
- When you're ready to take an **Amateur Radio examination** (Tech, General, or Extra), W1MX - The MIT Amateur Radio Society offers remote exams, free for students and youngsters. *There are apparently many other remote exam options*.

Bonus - with an Amateur Radio license, you'll be more attractive on dates 😀

Closing the Channel

- In its mission to grow Amateur Radio and make it more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to anyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex!
- My ongoing Thanks to Tina Stroh KD7WSF for, well, *everything* and Bill Vodall W7NWP as *Zero Retries Instigator in Chief*.
- My ongoing Thanks to pseudostaffers Dan Romanchik KB6NU and Jeff Davis KE9V for continuing to spot, and write about "Zero Retries

Interesting" type items, on their respective blogs, from Amateur Radio and beyond, that I don't spot on my own.

- Southgate Amateur Radio News consistently surfaces "Zero Retries Interesting" stories.
- The Substack email publishing platform makes Zero Retries possible. I recommend it for publishing newsletters.

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Thanks for reading!
Steve Stroh N8GNJ (He / Him)
These bits were handcrafted in beautiful Bellingham, Washington, USA

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